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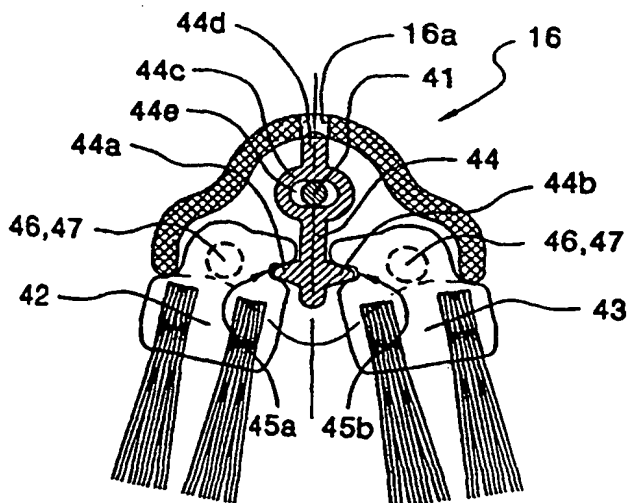
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(54) Title: BATTERY-POWERED TOOTHBRUSH



(57) Abstract: A battery-powered toothbrush has two bristle units in a toothbrush head which reciprocate the base and the tip of the teeth for brushing in a simple structure with a slim form and a detachable head bar. An elongated handle includes a rotation driving unit. A head bar has a bristle driving shaft rotated upon receipt of a rotational force from the rotation driving unit. The bristle driving shaft includes an eccentricity unit spaced apart from a first rotation axis line (Y). The bristle unit has a bristle support body onto which bristles are implanted, and the support body is rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth. A link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and reciprocating movement of the bristle unit.

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## BATTERY-POWERED TOOTHBRUSH

### BACKGROUND OF THE INVENTION

#### 5           1.       Field of the Invention

The present invention relates to an battery-powered toothbrush, and more particularly, to an improved battery-powered toothbrush having two bristle units in a toothbrush head which reciprocate the base and the tip of the teeth for brushing in a simple structure with a slim form and a detachable head bar.

10

#### 2.       Description of the Background Art

There have been proposed various types battery-powered toothbrushes. Among them are an battery-powered toothbrush having bristles rotated centering around a rotating axis which is vertical to the tooth face and an battery-powered  
15 toothbrush having a rotational shaft which is almost parallel to the row of teeth.

These battery-powered toothbrushes are mostly of a rotation type which require a reduction gear or have a structure allowing reverse-rotation. Accordingly, they inevitably have a complicate structure inside the head bar or for a driving unit.

Besides, in case of the battery-powered toothbrush having bristles rotated  
20 centering around a rotational axis, since the rotation central axis of the bristles is to be at a certain angle to the head bar, its construction is complicated.

In addition, the relative movement between the tooth face and the bristles is different from the way in which a general toothbrush is moved for brushing.

In case of the battery-powered toothbrush having the rotational axis which  
25 is almost in parallel to the row of teeth, which has cylindrical type bristles (i.e.,

toothbrushes as disclosed in Korean Laid Open No. 99-24569, Korean Utility Model Laid Open No. 84-607, Korean Laid Open No. 91-2400, Korean Utility Model Laid Open No. 94-6991), a switching unit or speed reduction is required. Besides, its bristle unit is too large.

5 In case where the size of the bristle unit is reduced, its strength becomes great as the bristles are shortened, possibly resulting in damaging gums.

Thus, development of an battery-powered toothbrush having a small size bristle unit is in demand which also allows users to brush their teeth in the similar method to the general brushing method. In addition, an battery-powered  
10 toothbrush having a simple driving force transmission structure is in demand.

## SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide an battery-  
15 powered toothbrush having two small bristle units and simple structure.

Another object of the present invention is to provide an battery-powered toothbrush having a structure that a plurality of head bars can be changeably assembled with a single elongated handle for use.

To achieve these and other advantages and in accordance with the  
20 purpose of the present invention, as embodied and broadly described herein, there is provided an battery-powered toothbrush having an elongated handle and a head bar combined with the elongated handle which allow bristles to be reciprocally moved along the lengthy direction of the teeth for brushing, wherein the elongated handle includes a rotation driving unit, and the head bar has a  
25 bristle driving shaft which is rotated upon receipt of a rotational force from the

rotation driving unit, the bristle driving shaft including an eccentricity unit spaced apart from a first rotation axis line (Y), a bristle unit having a bristle support body onto which bristles are implanted, the support body being rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth, and a link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and reciprocating movement of the bristle unit.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Figure 1 is a perspective view of an battery-powered toothbrush in accordance with the present invention;

Figure 2 is a plan view of the battery-powered toothbrush of Figure 1, showing a section of a part of the toothbrush in accordance with the present invention;

Figure 3 is a side view of the battery-powered toothbrush of Figure 1, showing a section of a part of the toothbrush as disassembled in accordance with the present invention;

Figure 4A is a sectional view of a head of the toothbrush when the bristles of the battery-powered toothbrush of Figure 1 are positioned at the upper and the lower gums in accordance with the present invention;

Figure 4B is a sectional view of a head of the toothbrush when the bristles of the battery-powered toothbrush of Figure 1 are positioned at the ends of the upper and the lower teeth in accordance with the present invention; and

Figure 5 is a sectional view of the part of a bristle unit installed at the battery-powered toothbrush of Figure 1 in accordance with the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Figure 1 is a perspective view of an battery-powered toothbrush, Figure 2 is a plan view of the battery-powered toothbrush, and Figure 3 is a side view of the battery-powered toothbrush as disassembled. Figures 2 and 3 shows the inner structure of the toothbrush by partially cutting it.

With reference to Figures 1 through 3, an battery-powered toothbrush includes an elongated handle 12 and a head bar 14. The head bar 14 is detachably attached to the elongated handle 12. There is provided a head portion 16 at the end of the head bar.

The elongated handle 12 is made of an elongated handle body 13 which

includes a rotation driving unit 20 and a circuit unit 21.

A switch cover 22 is assembled at the middle portion of the elongated handle body 13.

As shown in Figure 3, the switch cover 22 is formed of a film 23 of having  
5 an elasticity of a plastic resin at its outer side thereof, and a wall of a plastic resin is formed inside the film 23. The center of the film 23 is protruded, and a hole 25 is formed at the wall portion corresponding to the center of the film 23. The switch cover 22 is fabricated in a so-called in-mold injection molding method.

The end of the body 13 is clogged with a round shape bottom cap 26. A  
10 hole 27 is formed at the center of the cap 26. The cap 26 is fixed at the lower end of the body 13 by an elastic protrusion 28 in a so-called snap fit combining method. The driving unit 20 installed in the body 13 includes a motor 35 and a rotation transmission shaft 37.

The motor 35 is provided with a motor shaft 36. The motor shaft 36 and  
15 the rotation transmission shaft 37 are connected by a coupling 38. The coupling 38 is made of an engineering plasmatic material. The shafts 36 and 37 are press-fit to the coupling 38.

A circuit unit 21 is provided to rotate and control the motor 35, including a charging unit and a controller. The charging unit includes a battery 30 and an  
20 induction coil 31 for receiving power charged from an external source wirelessly. An additional charging unit (not shown) also includes an induction coil. An AC is induced to the induction coil 31, which is changed to a DC in the circuit of the charging unit and charged in the battery 30.

The controller supplies a current to the motor and the motor is rotated  
25 according to user's manipulation of the switch 32. The switch 32 is mounted on

the circuit board 33.

The switch 32 includes contact points 32a and 32b, and the contact point 32a is positioned at the end of a plate spring 34. The contact points 32a and 32b are separated at ordinary times. Being depressed, the contacts points are connected, and when the force for depressing is released, they are again separated by the restoring force of the plate spring 34.

The circuit is constructed in that when the switch 32 is depressed and released, the motor 35 is operated, and when the switch 32 is depressed and released, the rotation of the motor 35 is stopped.

As noted in Figure 3, the central protrusion of the switch cover 22 corresponds to the contact point 32a of the switch 32.

The circuit components of the charging unit and the controller are disposed on the circuit board 33.

With reference to Figures 1 through 3, the head bar 14 includes a head bar body 15. The head bar body 15 is detachably combined with the elongated handle body 13 of the elongated handle 12. A groove 15a at the lower end portion of the head bar body is designed into which the protrusion 13a provided at the upper end of the elongated handle body 13 is tightly inserted.

The rotation transmission shaft 37 is connected with the motor shaft 36 by the coupling 38 of the main body and smoothly rotated. When the head bar 14 is connected with the elongated handle 12, the rotation transmission shaft 37 is combined with a bristle driving shaft 40 by the coupling 39 of the head bar and transmits the rotational force.

The connections in this respect will now be described in detail.

The rotation transmission axis 37 has a cylindrical form. Its lower portion

37b is partially in a semi-cylindrical shape and press-fit to the coupling 38 of the main body, while its upper portion 37a is also in a semi-cylindrical shape, having a coupling flat surface 37d and an angled groove 37c at the circumferential face so as to be detachably fit the coupling 39 of the head bar.

5       The coupling 39 of the head bar includes a groove 3a into which the semi-cylindrical upper portion 37a, the coupling flat face 39d to be adjusted with the semi-cylindrical upper portion and a protrusion 39c to be inserted into the groove 37c.

10       The groove 37a of the upper portion 37a of the rotation transmission shaft 37 and the protrusion 39c prevents the head bar 14 and the elongated handle 12 from separating, which runs counter to the user's intention, and strengths their binding.

15       In addition, in order to prevent an insertion resistance at the upper portion 37a of the rotation transmission axis 37 due to a foreign material or the air resistance, the end of the upper portion 37a of the rotation transmission shaft is inclined and the inner side of the coupling 39 is also inclined for an easy insertion.

      The bristle driving shaft 40 is rotatably supported by the inner wall of the head portion 16.

20       Driving force transmission elements from the motor 36 to the bristle driving shaft 40 are sequentially disposed on the same rotational axis line (Y).

      The bristle driving shaft 40 includes an eccentricity unit 41 isolated as far as a predetermined distance from the rotation axis line (Y). The eccentricity unit 41 is rotated centering around the rotation axis line (Y), and the rotational movement of the eccentricity unit 41 is switched to a reciprocal movement of a link 44 so that  
25       two bristle units 42 and 43 are rendered to brush the teeth.



With reference to Figures 4A and 4B and 5, the eccentricity unit 41 is inserted at one end portion of the link 44, and there are provided a ring type bushing 44c having the guide hole 44e having a long slit form extended in the vertical direction to the lengthy direction of the link, and a protrusion 44d for  
5 guiding the linear reciprocal movement in the lengthy direction of the link 44.

A guide hole 16a is provided at the head portion 16 so that the protrusion 44d of the link 44 is can be smoothly reciprocated. The protrusion 44d is formed sufficiently long not so as to be released from the hole.

Two protrusions 44a and 44b are provided at the other end portion of the  
10 link 44, which are extended in the vertical direction to the lengthy direction of the link. The two protrusions 44a and 44b are inserted into grooves 45a and 45b formed at the middle portion of a support 45 of the bristle units 42 and 43, being engaged with each other like a rack and a pinion of a gear, so as to transmit the rotation movement transmitted along the rotation axis line (Y) to the two bristle  
15 units 42 and 43.

The first protrusion 44a is engaged with the first bristle unit 42 and the second protrusion 44b is engaged with the second bristle unit 43.

With reference to Figure 5, the two bristle units 42 and 43 include the bristle support 45. Two support grooves 48 and 49 are formed into which the first  
20 support shaft 46 protruded from the head portion 16 and the second support shaft 47 are inserted, respectively.

The bristle units 42 and 43 are rotatably reciprocated repeatedly as long as a certain angle centering around the bristle unit rotation axis line formed by the support shafts 46 and 47. The bristle unit rotation axis line is about perpendicular  
25 to the length direction of the teeth.

In the bristle units 42 and 43, the bristles 50 are implanted onto the support 45. The bristles are disposed by 6 lines at equal intervals. Of course, the bristles are not necessarily disposed in 6 lines and may be disposed in a more or a less lines. In addition, the height of the bristles 50 may be varied depending on  
5 the position in each line.

According to the construction of the link as described above with reference to Figures 4 and 5, when the eccentricity unit 41 is rotated centering around the rotation axis line (Y), it is guided by the guide hole 44e to reciprocally move the link in the lengthy direction, according to which the bristle units are rotatably and  
10 reciprocally moved repeatedly.

The operation of the battery-powered toothbrush of the present invention constructed as described above will now be explained with reference to the accompanying drawings.

First, when the central portion of the switch cover 22 is depressed, the  
15 motor 35 is driven and the motor shaft 35 is rotated. The rotation of the motor shaft 36 is transmitted to the rotation transmission shaft 37 and the bristle driving shaft 40. The rotation of the bristle driving shaft 40 is shifted to a reciprocal movement of the link 44 by the eccentricity unit 41, according to which the two bristle units 42 and 43 into which the protrusions 44a and 44b of the link 44 have  
20 been inserted are reciprocally and rotatably moved for brushing.

Several head bars 14 may be changeably inserted into the elongated handle 12 of the battery-powered toothbrush 10. Then, with only one elongated handle, several family members can use the battery-powered toothbrush by using their own head bar 14.

25 In the above described preferred embodiment, the battery and the

induction coil are provided for being charged, to which the charging battery (a secondary electric battery) supplies an electric power. Unlikely, however, the primary battery (a battery) may be used. Probably less preferred because of an electric shock, however, a wired charging method may be adopted instead of the wireless charging method according to the induction coil.

As so far described, according to the battery-powered toothbrush of the present invention, when a user brushes his or her teeth with the battery-powered toothbrush, brushing is performed along the axis line (called the tooth lengthy direction) connecting the base and the tip of the teeth in the same manner as the general brushing. In spite of having the two bristle units, the head portion is formed in the small size.

In addition, in spite of having the two bristle units, since the driving force transmitting mechanism has the simple structure, having an effect that the head bar feels slim and the weight of the battery-powered toothbrush itself can be reduced. This would solve any inconvenience of the user and certainly help children to use.

Moreover, the two bristle units are reciprocated in the opposite directions to evenly brush the upper teeth and the lower teeth. Also, since several head bars can be changeably installed at the single elongated handle, so that family members can advantageously use the battery-powered toothbrush.

Furthermore, by using the in-mold injection-molded switch, the depressing touch of the switch is improved, and permeation of water can be prevented.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the

details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalence of such meets and bounds are therefore intended to  
5 be embraced by the appended claims.

What is claimed is:

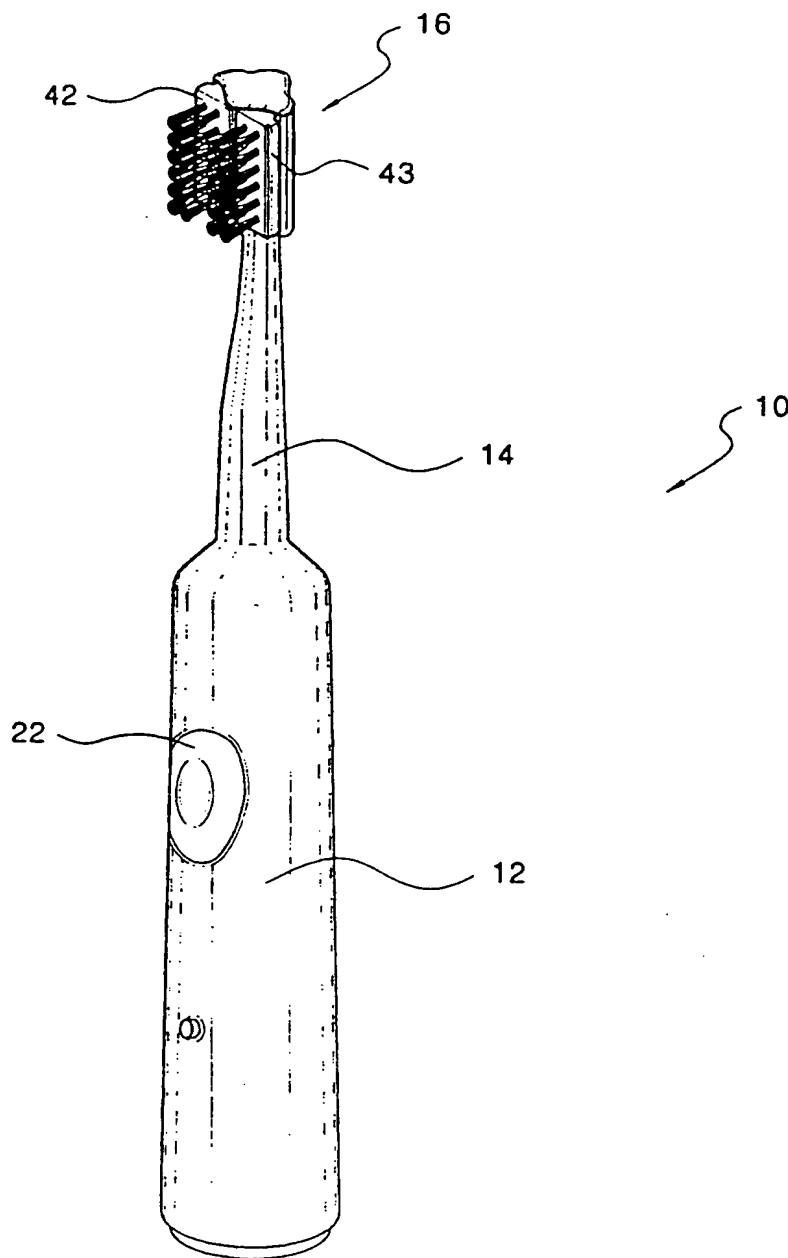
1. An battery-powered toothbrush having an elongated handle and a head bar combined with the elongated handle which allow bristles to be reciprocally moved along the lengthy direction of the teeth for brushing,  
5 wherein the elongated handle includes a rotation driving unit, and  
the head bar has a bristle driving shaft which is rotated upon receipt of a rotational force from the rotation driving unit, the bristle driving shaft including an eccentricity unit spaced apart from a first rotation axis line (Y), a bristle unit having  
10 a bristle support body onto which bristles are implanted, the support body being rotatably and reciprocally moved centering around a second rotation axis line almost perpendicular to the lengthy direction of the teeth, and a link is formed between the eccentricity unit and the bristle support body for shifting and transmitting the rotational movement of the eccentricity unit to a rotational and  
15 reciprocating movement of the bristle unit.
2. The battery-powered toothbrush of claim 1, wherein the head bar includes a pair of bristle units, grooves are formed at the side facing the support bodies of each bristle unit, the link includes two protrusions at one end thereof to  
20 be engaged with the grooves and a bushing having a hole into which the eccentricity unit is inserted at the other end thereof.
3. The battery-powered toothbrush of claim 1 or 2, wherein the head bar and the elongated handle are detachably attached.

4. The battery-powered toothbrush of claim 3, wherein the elongated handle includes a rotation driving shaft connected to the rotating driving unit, the head bar includes a coupling for connecting the bristle driving shaft and the rotation driving shaft, the coupling having a groove into which the rotation driving shaft is inserted, and the groove and the rotation driving shaft includes a combining protrusion and a combining groove, respectively.

5. The battery-powered toothbrush of claim 1 or 2, wherein the elongated handle includes a switch for controlling an operation of the rotation driving unit therein and a switch cover for covering the switch, the switching cover includes a film layer having an elasticity of a plastic resin and a resin layer which is in-mold injection-molded and formed at the lower portion of the film layer, and a hole is formed at the resin layer where a portion of the switch is positioned so that the switch can directly contact the film layer.

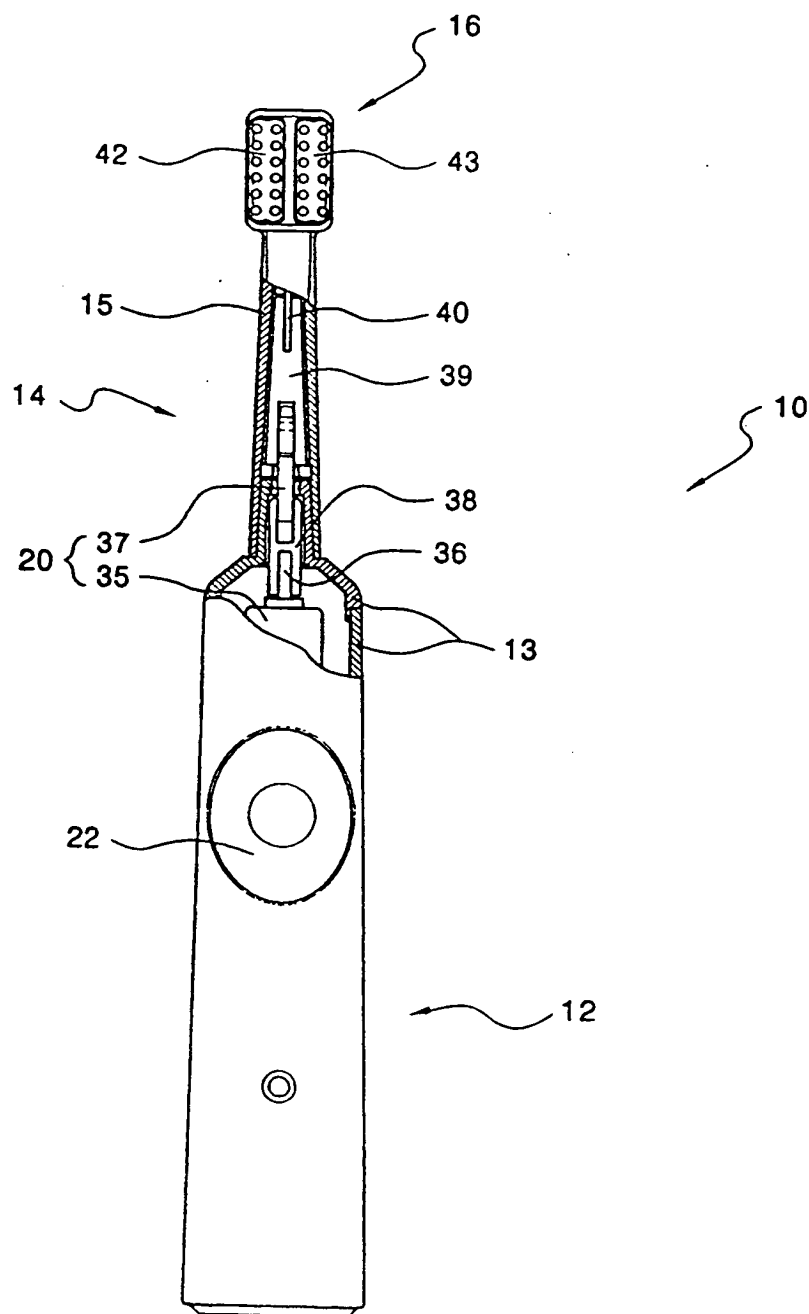
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Fig. 1



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Fig. 2





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Fig. 3

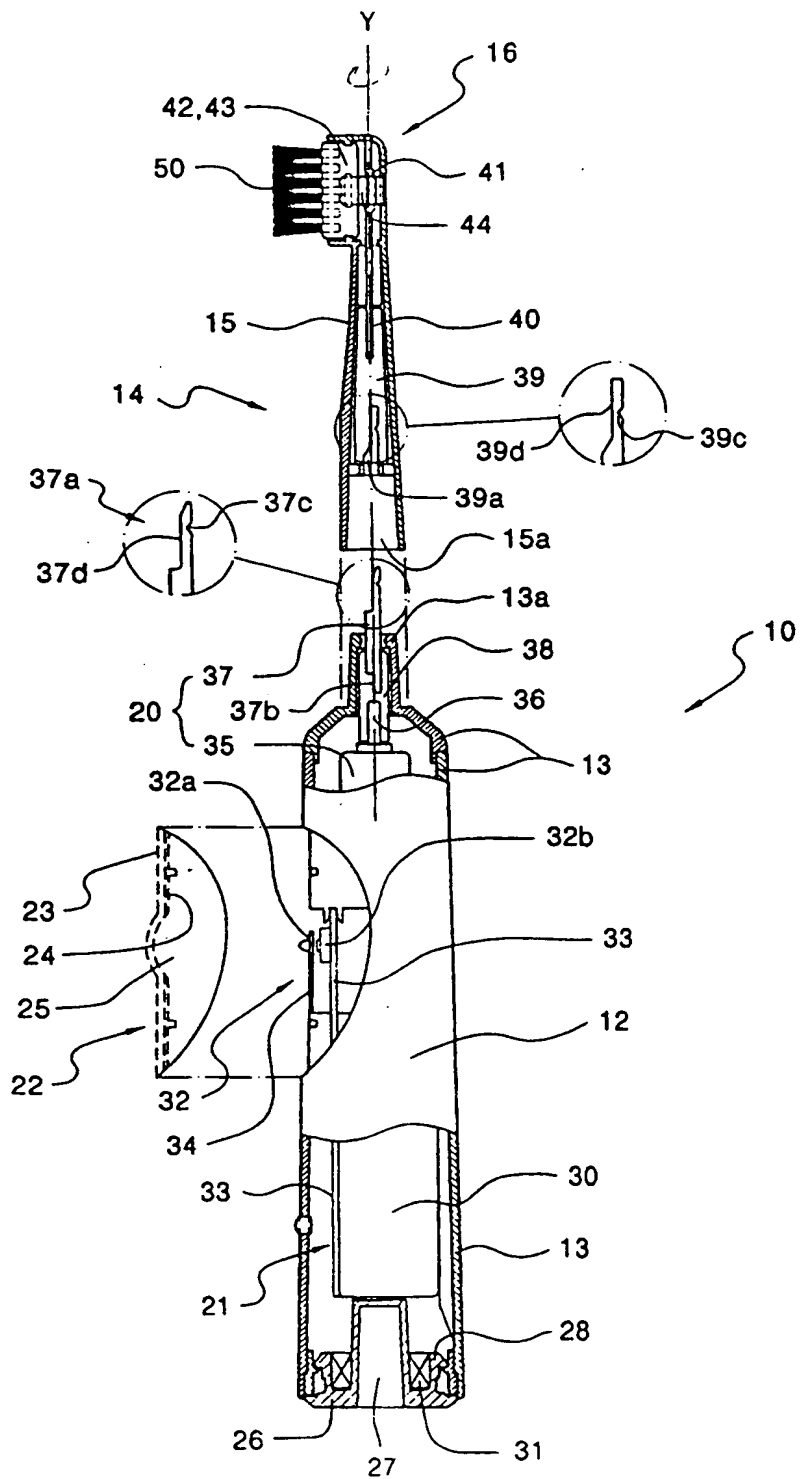
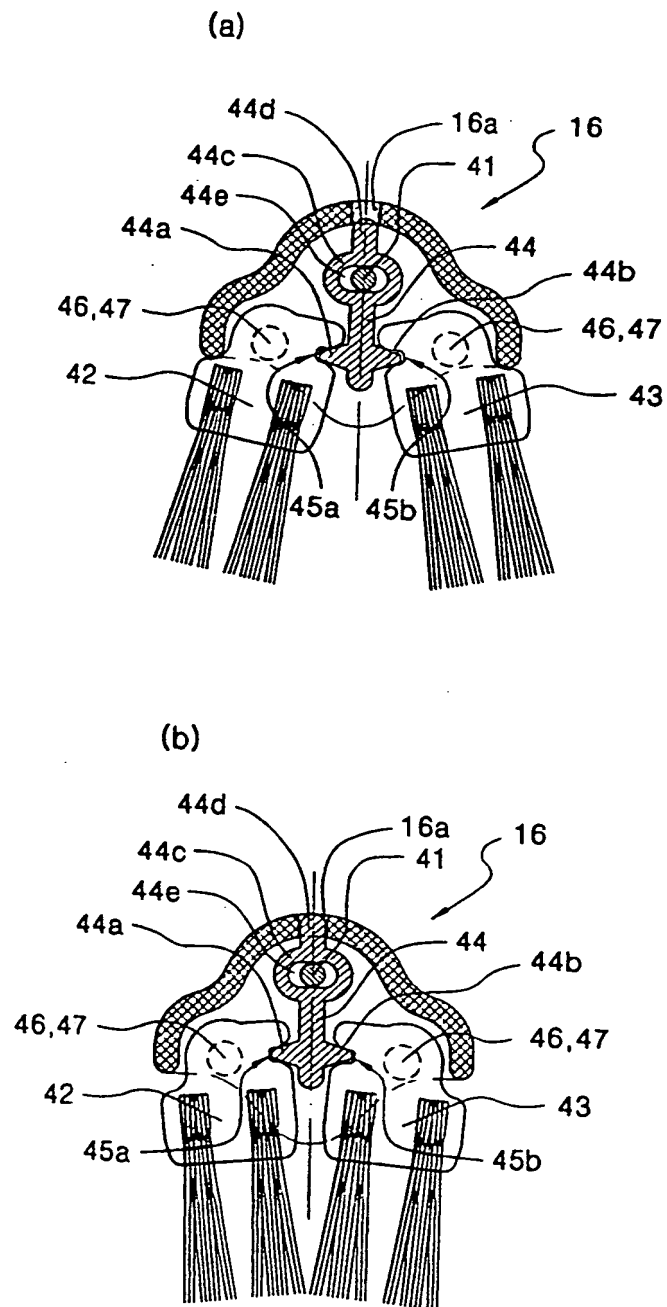


Fig. 4





# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR00/01477

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A46B 13/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC A46B 13/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR. IPC as above  
JP. IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP. A. 54-38851 (MORIYAMA TOSHIO) 24 March 1979 (24. 03. 1979) see claims; Fig. 7, 8.	1
A	JP. A. 6-343513 (PHILIPS ELECTRON NV) 20 December 1994 (20. 12. 1994) see the whole document; Fig. 1, 3, 6.	1 - 5
A	US. A. 5 689 850 (AVRAHAM SHEKALIM) 25 November 1997 (25. 11. 1997) (Family: none) see the whole document; Fig. 1.	1
A	US. A. 4 995 131 (HIROSHI TAKETA) 26 February 1991 (26. 02. 1991) see the whole document; Fig. 1, 3, 5.	1 - 5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

03 APRIL 2001 (03.04.2001)

Date of mailing of the international search report

04 APRIL 2001 (04.04.2001)

Name and mailing address of the ISA/KR  
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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/KR00/01477

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP-A-54-38851	24-03-79	CA-A-1115467	05-01-82
		CH-A- 633699	31-12-82
		DE-A-2838015	15-03-79
		FR-A-2401631	30-03-79
		GB-A-2005999	02-05-79
JP-A-6-343513	20-12-94	EP-A- 628291	14-12-94
US-A-4995131	26-02-91	AU-A-4377089	31-05-90
		DE-A-3938829	31-05-90
		FR-A-2639535	01-06-90
		GB-A-2225712	13-06-90
		JP-A- 2142508	31-05-90
		NL-A-8902908	18-06-90
		SE-A-8903954	26-05-90

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